## **Plant Disease Detection System for Sustainable Agriculture Assessment Week 1**

**Problem Statement -**

We aim to develop a CNN-based model capable of detecting and classifying plant diseases from images of leaves of various crops such as apple, cherry, grape, and corn. The model should accurately identify both healthy and diseased leaves, while also predicting the type of disease. This system supports precision agriculture by enabling early detection and effective disease management, thus improving crop yield and sustainability.

**Pipeline –**

The implementation of the plant disease detection model follows a structured pipeline to ensure accuracy, scalability, and efficiency. The major steps involved are described below:

1. **Data Collection & Loading**
   * A pre-collected dataset is used, consisting of three main folders: train, validation, and test.
   * Each folder contains categorized images (healthy/diseased) of different plant leaves.
2. **Uploading & Mounting Data**
   * Using Google Collab, the drive is mounted and the dataset is unzipped using Python code.
3. **Image Processing & Augmentation**

Raw image data is rarely clean or uniform. To make the images suitable for training:

* + Resizing is performed to bring all images to a consistent dimension.
  + Normalization scales pixel values for better learning efficiency.
  + **Augmentation** techniques such as rotation, flipping, and zooming are applied to artificially increase the dataset size and reduce overfitting.

1. **CNN Model Building**
   * A Convolutional Neural Network (CNN) is constructed to learn features and classify images.
   * During training, training data is used for learning and validation data is used to check learning progress.
2. **Model Evaluation**
   * After training, test data is used to evaluate the model’s performance and accuracy.
   * The model should be able to respond with the specific type of disease identified.

**Conclusion –**

This CNN-based plant disease detection system provides a powerful tool for early identification and classification of plant diseases. It contributes to improved decision-making in agriculture, resulting in healthier crops and reduced losses.